

Reservation of Right to Swear Behind References

Applicant reserves the right to swear behind any references which are cited in a rejection under 35 U.S.C. §§102(a), 102(e), 103/102(a), and 103/102(e). Statements distinguishing the claimed subject matter over the cited references are not to be interpreted as admissions that the references are prior art.

Rejections Under 35 U.S.C. § 103

Claims 11, 12, 24, 25, 30 and 32

Claims 11, 12, 24, 25, 30 and 32 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Aronowitz et al. (U.S. Patent No. 5,296,386) together with Grider et al (U.S. Patent No. 5,818,100).

Applicant respectfully objects to the combination of Aronowitz et al. and Grider et al. The Examiner states that Aronowitz et al. does not disclose a channel length. The Examiner then relies on Grider et al. to support that it would have been obvious to one skilled in this art to form Aronowitz et al.'s channel length less than 7 μ m.

Applicant's disclosure addresses difficulties surrounding the extremely small base widths inherent in bipolar devices and the formation of stable gate oxide layers over Si_{1-x}Ge_x transistor channels. See specification, page 2, lines 12-16 and page 3, lines 2-4. Applicant respectfully submits that Aronowitz et al. appears to be describing a large device. See, e.g., Aronowitz et al., column 2, lines 21-28 ("Those skilled in the art will appreciate that while FIG. 1B shows a distinct difference in thickness in the differential oxide layer 16 overlying the germanium-rich layer 18 for illustrative purposes, the actual thickness of the oxide overlying the germanium-rich layer 18 will be only several hundred Angstroms greater than the remainder of the oxide layer 16.").

Devices with gate oxide thickness of less than "several hundred angstroms" were well understood in the art at the time of filing for the Aronowitz et al. patent, i.e., March 6, 1991. See, e.g., Wolf, S., Silicon Processing for the VLSI Era, Vol. 2, p. 355, table 5.2, 1990 (showing the evolution of device structures having a gate oxide thickness of 125 angstroms by 1989). Yet Aronowitz et al. describes that the differential is several hundred angstroms. Applicant thus

respectfully submits that Aronowitz et al. appears to be teaching a device having dimensions significantly larger than standard devices.

As Applicant presented in a prior response, inherent characteristics of short channel devices preclude direct application of the knowledge associated with large channel devices. *See, e.g., Silicon Processing*, Vol. 2, § 5.5. Applicant respectfully submits that it is improper to rely on Grider et al. combined with Aronowitz et al. as Grider et al. does not provide a SiGe channel region adjoining a gate oxide, but instead purports to form its SiGe alloy over future source/drain regions. *See, e.g., Grider et al.*, column 4, lines 58-62; Figure 6. Because Applicant identifies problems associated with SiGe channel regions in short channel devices, and because Grider et al. does not address SiGe channel regions, Applicant respectfully submits that there is no motivation to combine the teachings of Grider et al. with Aronowitz et al.

Furthermore, please note that Grider et al. describes that if the gate and underlying channel have a length of 0.25 μ m, the required depth of the source/drain junctions with the channel should be less than about 1000 angstroms. Grider et al., column 1, lines 35-37. Yet Aronowitz et al. describes notching its source/drain regions in one example to a desired depth of 0.25 μ m, or 2500 angstroms. Aronowitz et al., column 4, lines 3-7. To notch the source/drain regions to a depth of 2500 angstroms implies that the total depth need be significantly greater than 2500 angstroms.

Given the inherent characteristic differences in large channel devices and short channel devices, Applicant respectfully submits that even if there were a motivation to combine the references, which Applicant denies, combining Grider et al. with Aronowitz et al. would thus change the principle of operation of Aronowitz et al. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. MPEP § 2143.01, citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).

In view of the above, Applicant respectfully submits that a combination of the references sufficient to reject Applicant's claims under 35 U.S.C. § 103 is improper. Furthermore, Applicant respectfully submits that a combination of the references would address an embodiment of Aronowitz et al. having a SiGe region overlying the source/drain regions, and not

an embodiment having a SiGe channel region. Accordingly, Applicant respectfully submits that claims 11, 12, 24, 25, 30 and 32 remain patentably distinct from the cited references. Applicant thus respectfully requests reconsideration and withdrawal of the rejection, and allowance of claims 11, 12, 24, 25, 30 and 32.

Claims 13, 26, 27 and 31

Claims 13, 26, 27 and 31 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Aronowitz et al. (U.S. Patent No. 5,296,386) together with Grider et al. (U.S. Patent No. 5,818,100) and Crabbe et al. (U.S. Patent No. 5,821,577).

As provided above, Applicant respectfully submits that claims 11, 24 and 30 are patentably distinct from the combination of Aronowitz et al. and Grider et al. The tertiary reference of Crabbe et al. fails to overcome the deficiencies of the primary and secondary references. As claim 13 depends from and further defines patentably distinct claim 11, claims 26 and 27 depend from and further define patentably distinct claim 24, and claim 31 depends from and further defines patentably distinct claim 30, these claims are also believed to be allowable. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection, and allowance of claims 13, 26, 27 and 31.

Claims 11, 14, 24, 25, 28, 30 and 32

Claims 11, 14, 24, 25, 28, 30 and 32 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Selvakumar et al. (U.S. Patent No. 5,426,069) together with Grider et al. (U.S. Patent No. 5,818,100).

As Applicant presented in a prior response, inherent characteristics of short channel devices preclude direct application of the knowledge associated with large channel devices. *See, e.g., Silicon Processing*, Vol. 2, § 5.5. Applicant respectfully submits that it is improper to rely on Grider et al. combined with Selvakumar et al. as Grider et al. does not provide a SiGe channel region adjoining a gate oxide, but instead purports to form its SiGe alloy over future source/drain regions. *See, e.g., Grider et al.*, column 4, lines 58-62; Figure 6. Because Applicant identifies problems associated with SiGe channel regions in short channel devices, and because Grider

et al. does not address SiGe channel regions, Applicant respectfully submits that there is no motivation to combine the teachings of Grider et al. with Selvakumar et al.

Given the inherent characteristic differences in large channel devices and short channel devices, Applicant respectfully submits that even if there were a motivation to combine the references, which Applicant denies, combining Grider et al. with Selvakumar et al. would thus change the principle of operation of Selvakumar et al. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. MPEP § 2143.01, citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).

In view of the above, Applicant respectfully submits that a combination of the references sufficient to reject Applicant's claims under 35 U.S.C. § 103 is improper. Accordingly, Applicant respectfully submits that claims 11, 14, 24, 25, 28, 30 and 32 remain patentably distinct from the cited references. Applicant thus respectfully requests reconsideration and withdrawal of the rejection, and allowance of claims 11, 14, 24, 25, 28, 30 and 32.

Claims 13, 26, 27 and 31

Claims 13, 26, 27 and 31 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Selvakumar et al. (U.S. Patent No. 5,426,069) together with Grider et al. (U.S. Patent No. 5,818,100) and Crabbe et al. (U.S. Patent No. 5,821,577).

As provided above, Applicant respectfully submits that claims 11, 24 and 30 are patentably distinct from the combination of Selvakumar et al. and Grider et al. The tertiary reference of Crabbe et al. fails to overcome the deficiencies of the primary and secondary references. As claim 13 depends from and further defines patentably distinct claim 11, claims 26 and 27 depend from and further define patentably distinct claim 24, and claim 31 depends from and further defines patentably distinct claim 30, these claims are also believed to be allowable. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection, and allowance of claims 13, 26, 27 and 31.

Claim 29

Claim 29 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Selvakumar et al. (U.S. Patent No. 5,426,069) together with Grider et al. (U.S. Patent No. 5,818,100) and Aronowitz et al. (U.S. Patent No. 5,296,386).

In view of the above, Applicant respectfully submits that the combination of Selvakumar et al., Grider et al. and Aronowitz et al. is insufficient to teach or suggest a SiGe channel region underneath and adjoining a gate oxide, wherein the channel region has a channel length of less than 7µm. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection, and allowance of claim 29.

New Claims

Applicant respectfully submits that elements in new claims 38-43 find support, by example and not by limitation, in the Specification, Figure 2. Applicant notes that a germanium molar fraction of about 0.6 is consistent with a critical layer thickness of approximately 100 angstroms, identified by Applicant as one value for the thickness of the channel region. Applicant further notes that a germanium molar fraction of about 0.4 is consistent with a critical layer thickness of approximately 300 angstroms, identified by Applicant as one value for the thickness of the channel region.

In view of the arguments presented above, Applicant respectfully submits that new claims 38-43 are patentably distinct from the cited references. In addition, Applicant notes that new claims 38-43 further recite germanium molar fractions of less than about 0.6 and less than about 0.4. Applicant respectfully submits that such elements further distinguish these claims from Aronowitz et al. in that Aronowitz et al. notes that the germanium-rich interfacial layer of the channel should be at least 95% (Aronowitz et al. column 2, lines 29-30 and column 4, lines 25-27) and implies that such concentration is critical (Aronowitz et al., column 3, lines 28-31).

Accordingly, Applicant respectfully requests entry and allowance of new claims 38-43.

AMENDMENT AND RESPONSE

Serial Number: 09/132,157

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CONCLUSION

Applicant believes the claims are in condition for allowance and requests reconsideration of the application and allowance of the claims. The Examiner is invited to telephone the below-signed attorney at 612-371-2103 to discuss any questions which may remain with respect to the present application. If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Assistant Commissioner of Patents, Washington, D.C. 20231 on November 30, 1999.

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